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Title: Measuring and Monitoring Sediment Processes at Large Scales

Topic Area: C7 – Measuring and Monitoring Sediment Processes

Objective: a) Define the potential of existing and emerging technology to address the methodological and measurement needs of RSM across multiple spatial and temporal scales, and b) recommend appropriate technologies and methods for adoption/development, evaluation and deployment.

Benefits: The proposed work provides a logical and progressive means to identify, screen, evaluate and select candidate technologies and methodological approaches for addressing RSM information needs and for supporting regional sediment management. Specifically, this work allows selection of technologies for obtaining process descriptions required to develop/improve/validate mathematical models and data for model input (RSM field need 1, 2, 3, 5, 15, 79), and to characterize sediments and sediment transport (RSM field need 61, 76, 77, 79, 82, 83, 84, 87, 89). The work will result in the identification of tools for conducting habitat evaluations (RSM field need 10, 11, 65), assessing landscape changes (RSM field need 10, 12, 15, 30, 61, 77), and describing linkages between watershed activities and water resource impacts (RSM field need 20, 24, 25, 41,75). The work also supports the development of assessment tools for planning and sediment management (RSM field need 25, 30, 41, 48, 49, 51, 54, 56, 61, 77). Shared needs for spatially-explicit information will also provide logical linkages to SMART and Geospatial Technologies Programs, and opportunities to add value to program products.

This work produces new tools and methods for the USACE and nation. It is an integral part of the Regional Sediment Management Research Program, and thus contributes primarily to support of the USACE's navigation, flood/storm damage reduction, and environmental protection and quality missions. It supports all 8 Civil Works strategic goals and 7 of 9 Listening Session objectives identified by HQUSACE as R&D priorities. With companion work units, it employs active technology transfer and insertion.

Work Description: Sedimentation phenomena (erosion, fate and transport, deposition) and environmental responses (e.g., material loss and landscape change, excessive turbidity, habitat destruction) occur across a broad range of temporal and spatial scales. These differences make difficult the task of obtaining appropriately scaled descriptions of processes and responses, designing and implementing ameliorative approaches, and evaluating management outcomes. Important questions to be addressed by RSM center on processes involved in the erosion, transport and deposition of sediment across multiple spatial scales, linkages between sediment sources and sinks, and deposition of sediments and the resulting impacts to water resources. Addressing these questions and successfully implementing appropriate management strategies will require a suite

of technological tools and methodological approaches that effectively provide information at commensurate spatial and temporal scales.

Proposed here is the first of several interrelated work units designed to ensure that measurement and monitoring needs for implementing regional sediment management are met. (For example, a proposed follow-on work unit is, "*Technologies and methods for measuring and monitoring sediment processes at large spatial and temporal scales,*" which will develop methods and technologies for describing sediment management processes and responses at large spatial and temporal scales using remote sensing technologies, including satellite imagers and hyper- and multispectral images, and appropriate methods for processing the resulting spatial information.) The current work unit will identify and evaluate existing and emerging technologies and methodological approaches. This evaluation will span the range of spatial and temporal scales appropriate for sediment management (large scale, mesoscale and local scale; local scale methods will be defined under the concurrent work unit "Measuring and monitoring at local scales."), as determined through the design and conduct of individual RSM work efforts. Selected technologies and methodological approaches will be adopted, adapted/developed, evaluated and demonstrated in two subsequent work units. The first of these will focus on technological approaches relevant to large spatial scales (e.g., watersheds, drainage basins, large water resource features), while the second will address information needs at meso- and local scales. Together, these efforts will provide the technological means to gather information across complex landscapes (from headwaters to water resources and coastal zones) and assess regional sediment dynamics over long time periods.

A panel of RSM researchers and technology experts will be convened as a means to identify measurement and monitoring needs as defined by RSM work efforts and as required for effective sediment management practices. In general, these involve descriptions of sediment characteristics, sedimentation-related processes and process outcomes at multiple scales needed for model development and application, the development of informatic or decision support systems, and the design of management strategies.

The same panel approach will be employed to identify existing and emerging technologies and methodological approaches relevant to identified measurement and monitoring needs. It is anticipated that technological approaches will include remote sensing using both satellite- and aircraft-borne sensors and imagers, measurement technologies based on seismic, acoustic, radar or other similar information gathering schemes, and innovative information analysis strategies as means to identify sediment characteristics, transport and origins. Together these technologies will allow regional sediment investigators and managers to gather data and synthesize information critical for developing, implementing and evaluating sound regional sediment management approaches. Participants will include ERDC PI's and PM of the Remote Sensing Program and RSMP, PI's who proposed measurement work under the RSMP, and representatives of the Federal Interagency Sedimentation Project Technical Committee.

An initial screening process will allow identification of technologies and methods that best meet information gathering needs. Selected technologies and methodological approaches will subsequently be evaluated based on efficacy, anticipated development effort, and expectation for fully meeting the intended information need. Emphasis will be placed on technologies that can be adopted or easily adapted to sediment management needs so as to reduce potentially high development costs. In addition, emphasis will be placed on technologies that provide rich data sets applicable to multiple needs for information. Screening and evaluation results will be reviewed by the panel of selected RSM researchers and technology experts, and included in a summary technical report. This report will also contain recommendations for subsequent development and deployment efforts to be conducted in the two subsequent and related work units.

Given the need to initiate efforts on selected technologies early in the RSM, it is recommended that development efforts under one or more technology areas be initiated during FY02 at full or partial funding levels. Doing so will ensure timely support to measuring and monitoring needs of the RSM. (The proposed effort titled "*Monitoring Threshold Levels of Volumes and Source Areas of Sediment in Transport*" is recommended.)

Since many RSM work units will not start until FY03 and FY04, ongoing efforts in these years will provide the means to identify evolving sediment management needs for measuring and monitoring technologies. Technical reports providing updated evaluations and recommendations will be prepared at the completion of each year's effort. Ongoing evaluations in FY03 and FY04 will also provide the opportunity to incorporate relevant information needs and products from the SMART and Geospatial Technologies Programs.

Products and Schedule:

The primary products of this work will be a defined set of sediment management measurement and monitoring needs and recommendations of technologies for further development.

Product	Scheduled
1. Evaluation team formed	Q2/02
2. Workshop to identify information needs and potential technologies.	Q2/02
3. TN: Technology needs for measuring and monitoring sediment processes at large scales	Q3/02
4. TR: Evaluation results and recommendations for development and demonstration of technologies to address large- and meso-scale sediment processes and responses	Q3/02
5. TN: Updated evaluations and recommendations	Q4/03

based on evolving RSM measuring and monitoring needs for technology to address large- and meso-scale sediment processes and responses

6. TN: Updated evaluations and recommendations Q4/04 based on evolving RSM measuring and monitoring needs for technology to address large- and meso-scale sediment processes and responses